EXHIBIT 17

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EXAMINER	
WANG, NICHOLAS A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 15/294,957	Applicant(s) Sherman et al.	
	Examiner NICHOLAS A WANG	Art Unit 1734	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 1/29/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 26-32 and 34-93 is/are pending in the application.

5a) Of the above claim(s) 40 and 44-45 is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 26-32,34-39,41-43 and 46-93 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 10/17/2016 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 9/19/2017, 1/24/2018, 12/19/2018, 3/05/2019.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED CORRESPONDENCE

Claims 26-32 and 34-93 are pending, and claims 26-32, 34-39, 41-43, and 46-93 are currently under review.

Claims 40 and 44-45 are withdrawn.

Claims 1-25 and 33 are cancelled.

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Election/Restrictions

2. Applicant's election of species i(2) and ii(2) in the reply filed on 1/29/2019 is acknowledged (see previous restriction requirement for further details). Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.01(a)).

3. Claims 40 and 44-45 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 1/29/2019.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 26-32, 34-39, 41-43, and 46-83 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. Specifically, the term "low solubility" in claims 26, 47, 60, and 76 is a relative term which renders the claim indefinite. The aforementioned term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Therefore, it is not clear to the examiner as to what degree of solubility is required by the term “low.” The examiner interprets the aforementioned term to be met by any degree of solubility that one of ordinary skill in the art could consider to be “low.”

6. Claims 28-29 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. Specifically, claims 28-29 recite the limitations of “…to improve tensile strength…” and “…without significantly affecting a dissolution rate…” Firstly, it is noted that “improve” is a qualitative term, such that it is unclear to the examiner as to what is required by the term “improve” because said term can refer to either an increase or decrease in properties depending on the application. The examiner interprets said term to refer to any increase or decrease in properties that would have been desirable. Secondly, it is unclear as to what degree of effect is

required by the recitation of “significantly affecting…” The examiner interprets the aforementioned recitation to mean any degree in change of dissolution rate that would have been considered to be “significant” by one of ordinary skill.

7. Claims 31, 34-35, 38-39, 41-43, 46, 49-52, 62-63, and 71 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. Specifically, the aforementioned claims recite the limitation '"”said particles" in line 1, respectively. There is insufficient antecedent basis for this limitation in the claim. It is unclear as to whether the claimed particles refer to “a plurality of particles,” “metal particles,” or “metal alloy particles” as recited in independent claims 26, 47, and 60. The examiner interprets the aforementioned recitation to refer to any of the above particles.

8. Claims 76-83 rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. Specifically, claim 76 recites “providing one or more secondary metals…selected from…carbon.” The examiner notes that carbon is not considered to be a metallic material, such that it is unclear to the examiner as to how carbon can be included in the recited list of “secondary metals.” The examiner interprets the instant claim to refer to any secondary metal as recited, in addition to carbon as a potential element.

Claim Rejections - 35 USC § 103

9. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

10. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

11. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. Claims 26-32, 34, 37-39, 41-42, and 72-75, is/are rejected under 35 U.S.C. 103 as being unpatentable over Seals et al. (US 2012/0177905) in view of Ye et al. (2004, *Review of recent studies in magnesium matrix composites*), or alternatively in view of the aforementioned prior art and further in view of Marya et al. (US 2007/0181224).

a. Regarding claim 26, Seals et al. discloses a method of manufacturing a metallic composite having nanostructures incorporated therein [abstract]; wherein said nanostructures are mixed and stirred into a liquid base material during casting to achieve a dispersion [0047]. The examiner considers the aforementioned method to naturally meet the claimed steps of heating, mixing, and cooling because said steps would naturally occur in a typical casting process. See MPEP 2145(II). Seals et al. further discloses that the base material can be a second-row metal alloy and that the nanostructure material can be carbon [0030]. It would have been obvious to select Mg from the disclosed group of “second-row metals” because one of ordinary skill would have been able to envisage each element of the group of elements disclosed by Seals et al. See MPEP 2144.08(II)(A)(4)(a). Seals et al. further discloses that nanostructures are inert, which the examiner considers to meet the limitation of “low solubility”

because an inert material will naturally have low reactivity and therefore have low solubility [0010, 0040]. See MPEP 2145(II).

Seals et al. does not expressly teach that the nanostructures are not fully melted during mixing and cooling. However, the examiner submits that the melting temperature of carbon is sufficiently higher than that of Mg such that one of ordinary skill would have naturally expected the carbon nanostructures of Seals et al. to not have been fully melted. See MPEP 2145(II).

Seals et al. further discloses that the nanostructures are incorporated into the composite structure along the grain boundaries [abstract]. Absent persuasive evidence to the contrary, the examiner considers all of the nanostructures of Seals et al. to be located on the grain boundary since Seals et al. is silent regarding a specific amount of nanostructures on the grain boundary, as would have been reasonably recognized by one of ordinary skill. Alternatively, Seals et al. does not expressly teach that at least 50 percent of particles are located on the grain boundary. However, the examiner submits that the method of Seals et al. is substantially similar to that of the instant claim such that a similar effect of particle dispersion to the grain boundaries would have been expected. See MPEP 2112.01. Specifically, the instant invention discloses that the aforementioned effect can be achieved through stir-casting and due to the inherent insolubility of the particle material and difference in atomic structure between the melt material and particle material [p.3 ln.17-20 of instant specification]. As stated previously, Seals et al. discloses stir-casting [0047]. The examiner also notes that carbon nanostructures are inherently insoluble in

the Mg melt, wherein carbon and Mg have different atomic structures such that a similar grain boundary structure would have been expected, as stated previously. Similarly, although Seals et al. does not expressly teach a dissolution rate as instantly claimed, the examiner submits that the substantially identical composite and method of manufacturing as disclosed by Seals et al. would naturally result in a similar dissolution property. See MPEP 2112.

The examiner notes that the recitations of "…to form a mixture," "…to obtain a desired dissolution rate," "…to obtain a composition and morphology," and "…to obtain a galvanic corrosion rate" are instances of functional language which is considered to be met by the instant claim because the disclosed method and structure of Seals et al. is considered to be fully able to achieve the aforementioned limitations.

Seals et al. does not expressly teach that the nanostructures can also include metal or metal alloy particles having a melting point greater than that of the base material. Ye et al. discloses that metals such as Cu, Ni, and Ti are known to be used as reinforcement agents in Mg composites because said metals have high melting points and low solubility [p.6161 col.2 ln.9-13]. Therefore, it would have been obvious to include metals of Cu, Ni, or Ti as a reinforcing agent for an Mg composite because said metals have high melting points and low solubility. The examiner notes that Cu, Ni, and Ti naturally have a higher melting point than Mg. See MPEP 2145(II).

Alternatively, Seals et al. and Ye et al. do not expressly teach a dissolution rate as instantly claimed. However, the examiner considers said limitation to be

a result-effective variable that would have been obvious to one of ordinary skill in view of Marya et al. Marya et al. discloses structural composites for oilfield applications [0005-0006]; wherein said composites can have compositions with enhanced reactivity (ie. faster dissolution rate) or reduced reactivity (ie. slow dissolution rate) relative to alkaline-alkaline earth elements in said composite because it is desirable to controllably enhance or delay degradation of the composite in oilfield applications depending on the specific application requirement [0007]. In other words, the rate of dissolution is disclosed by Marya et al. as a result-effective variable which allows desirable control over enhancement or delay of degradation of an oilfield component. Therefore, since the dissolution rate in general (ie. in any medium) is disclosed by Marya et al. to be a result-effective variable, as stated previously, the examiner submits that it is not inventive to discover the optimal or workable ranges of a dissolution rate when the general conditions of how controlling the dissolution rate allows one to desirably control the degradation of an oilfield component are previously disclosed in the prior art. See MPEP 2144.05(II).

b. Regarding claim 27, the aforementioned combinations disclose the method of claim 26 (see previous). As stated previously, Seals et al. further discloses stirring during casting, or stir-casting [0047].

c. Regarding claims 28-29, the aforementioned combinations disclose the method of claim 26 (see previous). Seals et al. further discloses that subsequent thermomechanical or field processing can provided tailored enhancement of the desired properties [0047]. The examiner considers thermomechanical

processing to meet the limitation of heat treatment. The examiner further considers thermomechanical or field processing to meet the limitation of deformation since the material will naturally have to undergo deformation in the aforementioned processes. See MPEP 2145(II). The examiner notes that the recitations of "…to improve" is an instance of functional language of the claimed heat treating and deforming, which is considered to be met by the disclosure of Seals et al. in view of the aforementioned interpretation of the instant claim limitations because the processing of Seals et al. is considered to be fully capable of improving mechanical properties while still maintaining desired properties (ie. dissolution rate) in the final material.

d. Regarding claims 30 and 72, the aforementioned combinations disclose the method of claim 26 (see previous). Seals et al. further discloses that the material can be molded for part formation, which the examiner considers to meet the limitation of "forming" [0047]. The examiner notes that the recitations of "…for a) separating…" and "…in a well drilling or completion operation" are instances of functional language of the claimed forming, which is considered to be met by the disclosure of Seals et al. because the examiner does not consider said limitations to impart any further significant structure or manipulative processing steps absent persuasive evidence to the contrary. Therefore, the examiner considers the part formation of Seals et al. to be fully capable of forming a part shape that meets the instant claim.

e. Regarding claim 31, the aforementioned combinations disclose the method of claim 26 (see previous). The examiner notes that the carbon of Seals

et al. and aforementioned metals of Ye et al. will naturally have a melting point as instantly claimed. See MPEP 2145(II).

f. Regarding claim 32, the aforementioned combinations disclose the method of claim 26 (see previous). Since Seals et al. does not disclose a specific amount of Mg, the examiner submits that one of ordinary skill would have reasonably been motivated to utilize a Mg material (ie. majority Mg) absent persuasive evidence to the contrary to arrive at the claimed invention. Alternatively, the examiner notes that the Mg composites of Ye et al. contain a majority of Mg as the matrix phase, as would have been recognized by one of ordinary skill.

g. Regarding claim 34, the aforementioned combinations disclose the method of claim 26 (see previous). As stated previously, Seals et al. discloses that the nanostructure particles can be carbon [0030]; and Ye et al. discloses inclusions of Cu, Ni, or Ti [p.6161 col.2 ln.9-13].

h. Regarding claim 37, the aforementioned combinations disclose the method of claim 26 (see previous). As stated previously, Seals et al. discloses that the particles can be nanostructures, which the examiner recognizes to mean nano-size particles, which are naturally smaller than the micron scale. See MPEP 2145(II).

i. Regarding claim 38, the aforementioned combinations disclose the method of claim 26 (see previous). The examiner considers a “second-row” material and carbon to be compositionally different.

j. Regarding claim 39, the aforementioned combinations disclose the method of claim 26 (see previous). The examiner considers the nanostructures of Seals et al. to naturally have a size and shape. See MPEP 2145(II). The examiner notes that the recitation of "…to control a dissolution rate" is an instance of functional language of the claimed shape, which does not impart any further significant structural limitations or manipulative processing steps absent persuasive evidence to the contrary. Therefore, the examiner considers the particle shape and size of Seals et al. to be fully capable of controlling a dissolution rate.

k. Regarding claim 41, the aforementioned combinations disclose the method of claim 26 (see previous). The examiner notes that carbon, Ni, Cu, and Ti all naturally have a higher cathodic potential than Mg. See MPEP 2145(II).

l. Regarding claim 42, the aforementioned combinations disclose the method of claim 26 (see previous). As stated previously, Seals et al. discloses that the carbon nanostructures are inert, which the examiner considers to mean that they have no reactivity (ie. zero solubility) [0010, 0040]. The examiner submits that, absent a persuasive teaching to the contrary, one of ordinary skill would reasonably consider an inert material to not be reactive (ie. not soluble, or zero solubility).

m. Regarding claims 73-75, the aforementioned combinations disclose the method of claims 26 (see previous). Seals et al. and Ye et al. do not expressly teach the dissolution rates as claimed. However, as stated previously, since Seals et al. discloses a substantially identical composite material and

substantially identical method of manufacture, the examiner submits that a similar property of dissolution rate would have been expected in the disclosure of Seals et al. relative the instant claims. See MPEP 2112.01. Alternatively, as stated previously, examiner considers said limitations of dissolution rate to be a result-effective variable that would have been obvious to one of ordinary skill in view of Marya et al. Marya et al. discloses structural composites for oilfield applications [0005-0006]; wherein said composites can have compositions with enhanced reactivity (ie. faster dissolution rate) or reduced reactivity (ie. slow dissolution rate) relative to alkaline-alkaline earth elements in said composite because it is desirable to controllably enhance or delay degradation of the composite in oilfield applications depending on the specific application requirement [0007]. In other words, the rate of dissolution is disclosed by Marya et al. as a result-effective variable which allows desirable control over enhancement or delay of degradation of an oilfield component. Therefore, since the dissolution rate in general (ie. in any medium) is disclosed by Marya et al. to be a result-effective variable, as stated previously, the examiner submits that it is not inventive to discover the optimal or workable ranges of a dissolution rate when the general conditions of how controlling the dissolution rate allows one to desirably control the degradation of an oilfield component are previously disclosed in the prior art. See MPEP 2144.05(II).

14. Claims 35, 47-52, 56-63, 67-71, and 84-89 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 26

above, and further in view of Hassan et al. (2002, *Development of a novel magnesium-copper based composite with improved mechanical properties*).

n. Regarding claim 35, the aforementioned combinations disclose the method of claim 26 (see previous). The aforementioned combinations do not expressly teach an amount of the particles. Hassan et al. discloses a magnesium-copper composite, wherein copper particles are included in an amount of 17.95 weight percent such that improved mechanical properties are achieved [abstract]. Therefore, it would have been obvious to modify the method of Seals et al. and Ye et al. by utilizing a specific amount of 17.96 weight percent of Cu particles such that mechanical properties can be improved.

o. Regarding claims 47, 52, 60, and 63, the examiner notes that the instant claim merely combines the limitations of claims 26 and 34-35, which are previously shown to be met by the aforementioned combination (see previous). Therefore, the examiner considers the disclosure of the aforementioned combination to also meet the limitations of claims 47 and 60.

p. Regarding claims 48 and 61, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). Since Seals et al. does not disclose a specific amount of Mg, the examiner submits that one of ordinary skill would have reasonably been motivated to utilize a Mg material (ie. majority Mg) absent persuasive evidence to the contrary to arrive at the claimed invention. Alternatively, the examiner notes that the Mg composites of Ye et al. contain a majority of Mg as the matrix phase, as would have been recognized by one of ordinary skill.

q. Regarding claims 49 and 71, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). As stated previously, Seals et al. discloses that the carbon nanostructures are inert, which the examiner considers to mean that they have no reactivity (ie. zero solubility) [0010, 0040]. The examiner submits that, absent a persuasive teaching to the contrary, one of ordinary skill would reasonably consider an inert material to not be reactive (ie. not soluble, or zero solubility).

r. Regarding claim 50, the aforementioned combinations disclose the method of claim 47 (see previous). As stated previously, Seals et al. discloses that the particles can be nanostructures, which the examiner recognizes to mean nano-size particles, which are naturally smaller than the micron scale. See MPEP 2145(II).

s. Regarding claims 51 and 62, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). The examiner notes that the carbon of Seals et al. and aforementioned metals of Ye et al. will naturally have a melting point as instantly claimed. See MPEP 2145(II).

t. Regarding claims 56-58 and 67-69, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). The aforementioned combination does not expressly teach the dissolution rates as claimed. However, as stated previously, since Seals et al. discloses a substantially identical composite material and substantially identical method of manufacture, the examiner submits that a similar property of dissolution rate would have been expected in the disclosure of Seals et al. relative the instant claims. See MPEP

2112.01. Again, the examiner alternatively submits that the claimed dissolution rates would have been obvious because dissolution rate is a result-effective variable in view of Marya et al. as stated previously. See MPEP 2144.05(II).

u. Regarding claims 59 and 70, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). Seals et al. further discloses that the material can be molded for part formation, which the examiner considers to meet the limitation of "forming" [0047]. The examiner notes that the recitation of "…in a well drilling or completion operation" is an instance of functional language of the claimed forming, which is considered to be met by the disclosure of Seals et al. because the examiner does not consider said limitations to impart any further significant structure or manipulative processing steps absent persuasive evidence to the contrary. Therefore, the examiner considers the part formation of Seals et al. to be fully capable of forming a part shape that meets the instant claim.

v. Regarding claims 84-89, the aforementioned combinations disclose the method of claims 34, 52, and 63 (see previous). The examiner notes that the inclusion of Cu particles of Hassan et al. meets the limitation of "particles including Cu."

15. Claim 36, 53-55, and 64-66 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 26 above, and further in view of Ye et al. (2005, *Microstructure and tensile properties of Ti6Al4V/AM60B magnesium matrix composite*, herein referred to as Ye et al. '05).

w. Regarding claims 36, 53-55, and 64-66, the aforementioned combinations disclose the method of claims 26, 47, and 60 (see previous). The aforementioned combinations do not expressly teach inclusions of Al and Zn as claimed. Ye et al. ('05) discloses a magnesium-titanium composite, wherein the magnesium material can be a AM60B grade having Al from 5.6 to 6.4 and Zn from up to 0.2 weight percent [abstract, table 1]. Ye et al. ('05) discloses said alloy to have high temperature strength, among other properties [abstract, p.162 col.1 ln.1-3]. Therefore, it would have been obvious to one of ordinary skill to modify the method of the aforementioned combinations by utilizing the Mg grade alloy disclosed by Ye et al. ('05) to achieve high temperature strength among other properties.

16. Claim 43 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 26 above, and further in view of Kumar et al. (2011, *Mechanical and tribological behavior of particulate reinforced aluminum metal matrix composites – a review*).

x. Regarding claim 43, the aforementioned combinations disclose the method of claim 26 (see previous). The aforementioned combinations do not expressly teach a particle surface area as instantly claimed. Kumar et al. discloses that particle parameters such as size and shape, and therefore surface area as determined by the examiner, is an important factor in affecting composite wear rate and other mechanical properties such as hardness, wherein hardness is specifically directly affected by reinforcement volume, and therefore surface area [p.62 ln.7-11, p.65 ln.11-13]. In other words, reinforcement surface area is

disclosed by Kumar et al. to be a result-effective variable which directly affects composite mechanical properties such as hardness and wear rate. Therefore, since Kumar et al. discloses surface area to be a result-effective variable as stated previously, the examiner submits that it is not inventive to discover the optimal ranges of surface area when the general conditions of how reinforcement surface area affects composite mechanical properties are previously disclosed in the prior art. See MPEP 2144.05(II).

17. Claim 46 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 26 above, and further in view of Hasan et al. (2002, *Development of a novel magnesium-copper based composite with improved mechanical properties*) and ASM Handbooks (2001, *Micromechanics of discontinuously reinforced MMCs*).

y. Regarding claim 46, the aforementioned combinations disclose the method of claim 26 (see previous). The aforementioned combinations do not expressly teach spherical particles as instantly claimed. As stated previously, Hasan et al. discloses a magnesium-copper composite, wherein copper particles are included in an amount of 17.95 weight percent in a size range of 8 to 11 micrometers such that improved mechanical properties are achieved [abstract]. Therefore, it would have been obvious to modify the method the aforementioned combinations by utilizing the Cu particles of Hassan et al. such that mechanical properties can be improved. The examiner notes that the particle size range of Hassan et al. meets the limitation of “varying diameters.” The aforementioned combinations does not expressly teach spherical particles. However, the

examiner considers the mere recitation of shape to be an obvious engineering choice that would have been obvious to one of ordinary skill absent concrete evidence that said shape was patentably significant. See MPEP 2144.04(IV)(B). Alternatively, ASM Handbooks discloses that theoretical analyses of metal matrix composite behavior assumes spherical particles [p.1 ln.15-16, p.2 ln.4-5]. Therefore, it would have been obvious to modify the method of the aforementioned combinations by specifying spherical particles because theoretical analyses assume spherical particles.

18. Claims 30, 76-83, and 92-93 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 26 above, and further in view of Marya et al. (US 2007/0181224).

z. Regarding claim 30, the aforementioned combinations disclose the method of claim 26 (see previous). Seals et al. further discloses forming the composite as stated previously; however, Seals et al. and Ye et al. do not expressly teach subsequently forming the composite into a device as instantly claimed. Marya et al. discloses that similar composites can be used for oilfield elements such as diverter balls [0008, 0011, 0058]. Therefore, it would have been obvious to one of ordinary skill to modify the method of Seals et al. and Ye et al. by forming the composite into a diverter ball to be useful in oilfield applications.

aa. Regarding claim 76 and 79, the examiner notes that the instant claim merely requires the limitations of claim 26 and 30, which are previously shown to be met by the aforementioned combination.

bb. Regarding claim 77, the aforementioned combinations disclose the method of claim 76 (see previous). Since Seals et al. does not disclose a specific amount of Mg, the examiner submits that one of ordinary skill would have reasonably been motivated to utilize an entirely Mg material (ie. majority Mg of greater than 50 weight percent) absent persuasive evidence to the contrary to arrive at the claimed invention. Alternatively, the examiner notes that the Mg composites of Ye et al. contain a majority (ie. greater than 50 weight percent) of Mg as the matrix phase, as would have been recognized by one of ordinary skill.

cc. Regarding claim 78, the aforementioned combinations disclose the method of claim 76 (see previous). The examiner notes that the carbon of Seals et al. and aforementioned metals of Ye et al. will naturally have a melting point as instantly claimed. See MPEP 2145(II).

dd. Regarding claims 80-82, the aforementioned combinations disclose the method of claim 76 (see previous). The aforementioned combination does not expressly teach the dissolution rates as claimed. However, as stated previously, since Seals et al. discloses a substantially identical composite material and substantially identical method of manufacture, the examiner submits that a similar property of dissolution rate would have been expected in the disclosure of Seals et al. relative the instant claims. See MPEP 2112.01.

ee. Regarding claim 83, the aforementioned combinations disclose the method of claim 76 (see previous). As stated previously, Seals et al. discloses casting the composite into a part form, which the examiner considers to meet the limitation of molding.

ff. Regarding claim 92, examiner notes that claim 92 merely requires the limitations of claims 37, 42, and 76 combined, which have been previously shown to by the aforementioned combination.

gg. Regarding claim 93, the aforementioned combinations disclose the method of claim 92 (see previous). As stated previously, Seals et al. discloses casting the composite into a part form, which the examiner considers to meet the limitation of molding.

19. Claims 90-91 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combinations as applied to claim 79 above, and further in view of Hasan et al. (2002, *Development of a novel magnesium-copper based composite with improved mechanical properties*).

hh. Regarding claims 90-91, the aforementioned combinations disclose the method of claim 79 (see previous). The aforementioned combinations do not expressly teach that Cu is included. Hassan et al. discloses a magnesium-copper composite, wherein copper particles are included in an amount of 17.95 weight percent such that improved mechanical properties are achieved [abstract]. Therefore, it would have been obvious to modify the method of Seals et al. and Ye et al. by utilizing a specific amount of 17.96 weight percent of Cu particles such that mechanical properties can be improved.

20. Claims 59 and 70 is/are rejected under 35 U.S.C. 103 as being unpatentable over the aforementioned combination as applied to claims 47 and 60 above, and further in view of Marya et al. (US 2007/0181224).

ii. Regarding claims 59 and 70, the aforementioned combinations disclose the method of claims 47 and 60 (see previous). Seals et al. further discloses forming the composite as stated previously; however, the aforementioned combination does not expressly teach subsequently forming the composite into a device as instantly claimed. Marya et al. discloses that similar composites can be used for oilfield elements such as diverter balls [0008, 0011, 0058]. Therefore, it would have been obvious to one of ordinary skill to modify the method of Seals et al. and Ye et al. by forming the composite into a diverter ball to be useful in oilfield applications

Double Patenting

21. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

22. Claims 26, 34-35, 41, 47, 52, 58, 60, 63, 69, and 75 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 33, 37-39, and 61-62 of copending Application No. 15/966,759 in view of Seals et al. (US 2012/0177905). The limitations of copending claims 33, 37-39, and 61-62 meet all of the limitations of instant claims 26, 34-35, 41, 47, 52, 58, 60, 63, 69, and 75, either

explicitly or inherently, except for the limitation of having at least 50 percent of additives/particles located in the grain boundaries. However, as stated in the previous rejection sections, Seals et al. discloses that it is desirable to incorporate nanostructures into the composite structure along the grain boundaries such that properties can be enhanced [abstract, 0040]. Absent persuasive evidence to the contrary, the examiner considers all of the nanostructures of Seals et al. to be located on the grain boundary since Seals et al. is silent regarding a specific amount of nanostructures on the grain boundary, as would have been reasonably recognized by one of ordinary skill. Therefore, it would have been obvious for one of ordinary skill to modify the limitations of the aforementioned copending claims to arrive at the instant claims by specifying the additives/particles to be located in the grain boundaries such that properties can be improved.

This is a provisional nonstatutory double patenting rejection.

Conclusion

23. No claims allowable.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICHOLAS A WANG whose telephone number is (408)918-7576. The examiner can normally be reached on usually M-F: 7-4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jonathan Johnson can be reached on 5712721177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NICHOLAS A WANG/
Examiner, Art Unit 1734

/COLLEEN P DUNN/
Primary Examiner, Art Unit 1736